

comprising at least one polymeric quaternary ammonium compound[s], as a functionally primary component, and polyacrylamide, said components being present in the composition in a ratio to enable the at least one ammonium compound to function as a primary component in forming microflocs for the biological thermophiles and the composition to function as an agent for dewatering biological sludge from a thermophilic digestion process.

REMARKS

Request For Merger:

Applicant alerts the office to the fact that a broadening reissue was filed on the instant patent. That reissue received application number 09/733,392; filing date of 12/07/00. The reissue application has been assigned to group art unit 1724.

Applicant respectfully requests merger of the instant re-examination with the recently filed reissue under 37 C.F.R. 1.565. Merger would permit timely resolution of both proceedings and prevent inconsistent and possibly conflicting amendments from being introduced into the two proceedings on behalf of the patent owner.

Examiner Chester Barry was alerted to the existence of the reissue by phone in December, 2000.

Applicant submits herewith a copy of the Amendment Paper amending the claim as submitted in the above-referenced reissue, as well as a discussion of the "source" in the Declaration.

Note: The above amendments incorporate the changes to the claims in the reissue application.

Claim Construction Issues

"As Primary Component" - Applicant respectfully traverses the Examiner's construction of the meaning of "as primary component" as used by Applicant in Applicant's claims. Applicant uses "primary", in the phrase "as primary component", in the sense of first in order of development. That is, the polymeric quaternary ammonium compound is primary in the order of development, as with respect to the polyacrylamide, in performing the function of dewatering sludge.

Applicant's statements and examples indicate that the polymeric quaternary ammonium compound could be "added", when viewed chronologically, either simultaneously or essentially simultaneously with the polyacrylamide or prior to the polyacrylamide. In fact, the Examiner so

notes in the instant Office Action in a later discussion of the phrase "along with". Functionally, or in the order of development, the polymeric quaternary ammonium compound operates prior to the polyacrylamide. In regard to the chronological order in which the ammonium compound and polyacrylamide are added, the polyacrylamide could be added "along with" the ammonium compound. Alternately, examples 1-3 illustrate adding the polyacrylamide reasonably soon thereafter. The order of development of the action of the two components to enhance the dewatering of the sludge is indicated by the word primary. Functionally speaking, the ammonium compound creates microflocs. The polyacrylamide amalgamates the microflocs into larger flocs for dewatering. The patentee's statements as cited by the Examiner support this interpretation.

The Abstract, for instance, supports the above interpretation. In the Abstract the Applicant states that four versions of the chemical method are presented. The primary component in the four versions is polyquaternary amine, preferably DADMAC and/or epi-DMA. By the first method the polyquaternary amine is added directly "along with" a cationic polyacrylamide to the biological sludge. By the second method the polyquaternary amine and polyacrylamide are added separately. (The Examiner notes that the instant patent addresses methods one and two.) By the third method quaternized polyacrylamide having a polyquaternary amine as part of its polymer chain is produced by co-polymerization and is added individually to the sludge. By the fourth method the quaternized polyacrylamide, above from method three, is added in concert with an additional cationic polyacrylamide to the sludge. Thus, as per the Abstract, in method one the ammonium compound and polyacrylamide are added essentially together whereas in the second method they are added separately. In the third and fourth methods the ammonium compound is co-polymerized into the polyacrylamide, the fourth method adding in concert additional polyacrylamide. Again, as the Examiner points out, the instant claims 1-16 relate to methods 1 and 2.

In summary, Applicant submits that the Examiner's interpretation of "primary" in the phrase "as primary component" is not the interpretation true to the specification. Rather, "primary" as used in the phrase "as primary component" should be interpreted as first in the order of development, when comparing the operation and functionality and efficacy of the polyacrylamide and ammonium compound in the process of dewatering biological sludge.

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"Adding . . . Compound" Plural - Applicant submits that the subject of topic 5 under the heading of Construction of Claim 1 of the 12/04/00 Office Action, the resolution of singular or plural, has been addressed and resolved in the Reissue Application and with the reissue claims and is reflected in the amended claims submitted above. The reason for the confusion and the error is explained in the reissue Declaration of the Applicant, the insert sheet with explanation also attached hereto for convenience. To recap, the reason for the confusion was an apparent error in understanding of the patent attorney involved in filing and prosecuting the application, as explained to the inventor. The attorney involved conveyed the impression to the inventor, and apparently believed, that by patent claim drafting convention the use of the plural in English covered "one or more", in patent claims. It was the inventor's intent to cover one or more. Thus, the inventor thought that interchangeably using singular and plural was proper and of no import. The amended claims in the reissue clarify that.

Further, in regard to the singular-plural issue, as the Examiner points out in the Action, examples 1-3 report dewatering performance of processes according to methods 1 and 2 and thus fall within the scope of claim 1. For the quaternary ammonium compound, example 1 uses one particular DADMAC. Examples 1, 2 and 3 each use one particular DADMAC, differing in viscosity. Thus, the Examiner's interpretation of the meaning of "adding . . . compounds" as referring to two or more compounds would mean that examples 1-3 do not fall, nor do any other examples fall, within the scope of claim 1. E.g., no examples would fall within the scope of claim 1.

(In regard to the prosecution history of related patent, U.S. Patent No. 5, 906,750, Applicant did intend therein for the phrase "polymeric quaternary ammonium compounds, aluminum sulfate, ferric chloride and blends thereof as primary component" to refer to at least one of those on the list. The Applicant believed that the choice of language accomplished that intent. We believe that the prior attorney believed that also. A reissue application to clarify the above issue is docketed to be filed.)

In summary, Applicant never intended claim 1 to require the addition of at least two polymeric quaternary ammonium compounds and at least two polyacrylamide compounds. Such interpretation does not read on the Applicant's own examples. The claims are at least ambiguous on this issue, as the Examiner's careful analysis evidences. A claim interpretation that does not read upon the patentee's examples or drawings or preferred embodiments is disfavored.

Rejection of Claims

In regard to obviousness-type double patenting rejections, Applicant is willing to submit a terminal disclaimer, as necessary.

COMMENTS ON STATEMENT OF REASONS FOR PATENTABILITY AND/OR CONFIRMATION

Applicant agrees with the Examiner that McGrow does not anticipate Applicant's claims because the suspension to which McGrow's polymeric coagulant and flocculent is added is not a biological sludge resulting from a thermophilic digestion process, as required claim 16. The same comment applies for Chung.

Further, the cited references do not render claim 1 obvious, singly or in consideration with each other or other references. Applicant's reasoning here is offered below.

Re Non Obviousness

Historical Perspective

One discovery of Richard Haase, which forms a basis for the instant invention and is reviewed in the Haase patent specification, was how and why thermophiles behave differently from mesophiles in dewatering biologically digested sludge.

Mesophiles naturally secrete a polysaccharide that is tackyfyng. This tackifyng polysaccharide produces a natural attraction between mesophillic bacteria that causes a natural coagulation and a natural formation of microfloc. This tackifyng coagulation can be seen under a 40X microscopic amplification.

Given the natural coagulation of mesophillicly digested sludge, flocculation or bridging of the coagulated microfloc required only a high molecular weight polyacrylamide, one that is usually cationic, to create a large floc for dewatering equipment.

It was known that thermophilically digested sludge was difficult to dewater.* Richard Haase believes he discovered why: e.g. thermophilic bacteria do not secrete a tackifyng

* See three attached articles from an April, 2000 conference discussing the difficulty of dewatering thermophiles. Note that all of these articles have a direct or indirect connection with College Station. As examples 6 and 7 indicate, Haase had taught College Station what he knew and had learned in September, 1996.

polysaccharide. Rather, as Richard believes he discovered, thermophiles naturally repel each other. It is believed that indicia of this "repulsion" can be seen under a microscope at 40X amplification. Under the same amplification thermophilic bacteria are seen as almost "buckshot" in appearance.

This perceived "repulsive behavior", Richard Haase determined, was likely what was making the dewatering of thermophilic biosolids a challenge. Consistent with this theory, he believed he then understood the reason why dewatering thermophilically digested sludge typically required a significant increase in dosage of the standard polyacrylamide typically successfully used for dewatering mesophilically digested sludge. In the dewatering of thermophilically digested sludge, accomplished by significantly enhanced dosages of the traditional polyacrylamides (of any charge character,) Haase came to believe that the polyacrylamides first had to overcome the unexpected and unappreciated repulsive forces of the thermophiles. This was necessary in order to cause coagulation before flocculation could occur. Coagulation with a high dosage polyacrylamide might be happening, Richard surmised, by increasing the dosage of the polyacrylamide until what occurred was a charge balance at the cellular level, causing coagulation. Once that coagulation was accomplished, the polyacrylamide dosage, if increased further, could cause flocculation. However, in many cases Richard surmised that a charge balance was difficult to achieve. In many cases a good dewatering floc was never achieved, or never reliably achieved, with the polyacrylamide alone, of any dosage.

Having surmised what he perceived to be the problem, Richard Haase speculated upon what could be used was to overcome the repulsive forces of the thermophiles before one could form a bridging or flocculating mechanism with the polyacrylamides. Although he was somewhat concerned that any lower molecular weight species would increase rather than decrease efficiency, due to the molecular weight requirement of the flocculent for dewatering equipment, and that use of the low molecular weights would end up only increasing costs, he knew at least from drinking water applications that non-biosolids could be coagulated with low molecular weight coagulants. Many such low molecular weight coagulants were known to be used successfully, including: aluminum salts, primary amines, secondary amines, tertiary amines, polyquaternary amines of various cationic character, acrylic acid polymers, polyacrylamides of various cationic and anionic charge character, as well as those of nonionic charge, starches, granular activated carbon, powdered activated carbon, phosphate polymers and

phosphoric acid, sulfuric and hydrochloric acid, iron salts, thio-carbonates, aluminum polymers and sodium aluminate. Richard tested these known species to form a microfloc on the thermophilically-digested sludge. The non-quaternized amines, carbon, starches, acids, sulfidic species, anionic species, phosphates and aluminum polymers did not test well. Richard Haase discovered, however, through his testing, that for whatever reason the polyquaternary amines and the metal salts did test well, apparently overcoming successfully the postulated repulsive forces of the thermophiles to form a microfloc at a cost effective dosage level. Further testing revealed the polyquaternary amines and metal salts to perform well in combination with polyacrylamides to dewater the thermophilically digested sludge, as compared to dosages of the polyacrylamides alone.

The patentee submits that McGrow and Chung each teach coagulating with a polymeric quaternized ammonium compound prior to flocculating with a polyacrylamide in order to coagulate nonbiological solids associated with their (non thermophilically digested) sludge, whether or not the sludge had mesophilles. This is explicit in Chung and implicit in McGrow. The small margin of improvement in McGrow is evidence to such. None of the cited references, thus, teach or suggest the usefulness of polymeric quaternized ammonium compound, as a primary component, to coagulate biological thermophiles, nor offer any motivation to make the combination.

Reconsideration and further examination is respectfully requested.


Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require action, it is respectfully requested that the Examiner telephone Sue Z. Shaper, Applicant's Attorney at 713-550-5710 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

2/5/01

Date



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